

SCIENCE.

FRIDAY, FEBRUARY 4, 1887.

COMMENT AND CRITICISM.

THE ANNUAL REPORTS of President Eliot of Harvard always contain suggestive reading for those who are interested in the advance and improvement of teaching, as well as in teaching itself. The constant effort to seek out and put into practice better methods of instruction, or methods more in keeping with the needs of the time, has been pre-eminently a characteristic of the present administration at Harvard. This was well pointed out by President Angell of Michigan in his after-dinner speech at the Harvard celebration last November. He alluded to the debt that all American colleges owe to the old university for the bold spirit of experiment that has led to the recognition of the difference in value between the traditional, customary, and conventional methods, inherited from previous generations, and the new, fresh, original methods, that contribute their share to the advance of the age. Any thing, he said, rather than stagnation in educational matters. Certainly there is no stagnation at Harvard, and the many changes of the last fifteen years seem only to prepare the way for more.

One of the present concerns of the college is naturally to secure good teaching for those who may desire to take entrance examinations in science instead of in one of the classics. It is well, therefore, to note President Eliot's attitude on this question. He says, "A serious difficulty in the way of getting science well taught in secondary schools has been the lack of teachers who knew any thing of inductive reasoning and experimental methods." One reason of this is that "good school methods of teaching the sciences have not yet been elaborated and demonstrated, and it is the first duty of university departments of science to remove at least this obstacle to the introduction of science into schools. . . . Science can never be put on the right footing at the university, so long as it is practically excluded from secondary schools, or is admitted only to be taught in a positively harmful way." This brings to the front as important a matter as has lately been

considered in the development of collegiate study, and young men may well consider the opportunity that it will open for them. For the next twenty years, the preparatory schools will show a growth on the side of science-teaching, the like of which has not been seen in this country, and really good teachers of chemistry and physics will be in increasing demand. It will be a fortunate university that shall supply the most of these teachers.

An interesting paragraph of the report relates to the "list of publications of Harvard university and its officers, 1880-1885." "In this list, about three-quarters of the 1,813 entries relate to science, including in that term medicine. Very inaccurate estimates of the relative activity in literary and scientific publications of some leading American universities having of late years obtained currency, and perhaps credit, through the public press, it is permissible to remark in the interests of truth, that it would be discreditable indeed to Harvard university — old and well-equipped as it is — if any other American institution could approach it in the range and volume of its annual literary and scientific publications." The excess of scientific publications over literary would be much reduced if pages instead of titles were counted; for in science a larger number of brief monographs on limited topics can be found than there is any equivalent for in literature.

During the last twenty years, while scientific studies were finding their place in the college elective lists, the Lawrence scientific school, once a leader among its fellows, has been steadily losing in number of scholars, and hence in influence. For some years past it has suffered seriously, simply from being overshadowed by the growing college across the street. Some have thought that this meant a discouragement to science-teaching at Cambridge, but the very reverse is the case. When the school was founded, the college was narrow, and saw no propriety in allowing a wide variety of study to its undergraduates. There was no advanced teaching in physical or natural science in the college till 1871, and ambitious students of these subjects in the earlier years had

to go to the Lawrence school for them, if they came to Cambridge at all. Now the same class of students undoubtedly goes to the college, attractive in so many ways, for its lines of study have been extended to include nearly every thing at first found only in the scientific school, in accordance with what is vaguely termed the 'spirit of the age;' but it should be recognized that this spirit has been strongly guided by just such institutions as the Lawrence school, whose graduates include a large number of prominent and influential men. If success is to be measured by the share taken in the labor of bringing neglected studies into their proper position, the liberality of Abbott Lawrence and James Lawrence has been successful even beyond their hopes.

In view of these altered relations, President Eliot recommends that the separate organization of the Lawrence scientific school should be discontinued; that the college faculty should be intrusted with the function of recommending to the governing boards candidates for the degree of bachelor of science; and that the academic council of the university should recommend candidates for the graduate degree of civil engineer, the underlying degree being either A.B. or S.B. The Lawrences would still be commemorated in the names of certain professorships, although no longer attached to a separately organized school. The first of these recommendations will, it is to be hoped, commend itself to the authorities concerned; for the separate existence of the school is not sufficiently encouraged by its present circumstances, and is not likely to be by any thing visible in the future. The third recommendation is not of a kind to provoke unfavorable action. It is to the second recommendation that the most interested discussion will turn. If it result in uniting bachelors of science with bachelors of arts in one body of alumni, the preliminary examinations and the undergraduate courses of study being equivalent, it will be one of the great steps in the advancement of scientific education at Harvard college.

WHAT MAY BE CALLED the official autobiography of the knights of labor is contained in an article by Carroll D. Wright in the current number of the *Quarterly journal of economics*. To be sure, Mr. Wright is not a member of the order; and we have had other accounts of its genesis before,

notably that detailed one published in the large work on the labor-question, edited by Mr. George E. McNeill. But we learn from a footnote that Mr. Wright's article was submitted, previous to publication, to several officers and members of the order, and was by them pronounced correct in all statements of fact. It is this that gives the sketch what we have called its official character. Mr. Wright begins by stating that two fundamental ideas underlie all labor organizations, some choosing one, and some the other. The first of these ideas is that of the association of all men of like employment, and on it the mediaeval guilds and the modern trades-unions were founded. The second idea is of broader scope, and takes no account of particular vocations. It seeks to organize all laborers into a single association, and is of later growth than the idea underlying the guilds and trades-unions. On it the celebrated International was founded, and the no less celebrated knights of labor take it as their starting-point. This second idea is both unsound in theory, and is every day proving itself pernicious in practice. It calls for the division of society at large into classes, and arrays the one against the other. As a matter of fact, no such cleavage of society is possible on any but the most superficial reasoning. In this country, where we recognize no aristocracy of birth, and where the industrial organization is democratic to the last degree, the attempt to so divide society is especially foolish and short-sighted. Though it may create uneasiness and disturbance for the time being, it is in the end certain to fail. If by any chance the advocates of the idea in question should succeed in their endeavor to create industrial classes and to array them against each other, the very first conflict would scatter their house of cards in every direction. It would require a very great turning-back of the wheels of progress to make it possible for the American idea of individual liberty and personal responsibility to be overcome by the ancient and discarded idea of corporate action and corporate responsibility.

With the various stages in the development of the knights of labor we are already fairly familiar, but Mr. Wright puts the facts again before us in a very clear and connected way. We learn how the personal character and history of Uriah S. Stephens, the founder of the order, impressed themselves upon its early organization, and how the order struggled along from its inception in

Philadelphia on Thanksgiving day, 1869, until the general assembly at Detroit in 1881 freed it from many of the restrictions placed upon it by Mr. Stephens, and made it so popular with certain sections of the people that since that time its growth has been phenomenal in the history of labor organizations. Mr. Stephens's controlling ideas seem to have been two, — first, that surplus labor always keeps wages down (it does not seem to have occurred to him that improving the quality of labor will cause wages to rise); and, second, that nothing can remedy this evil but a purely and deeply secret organization, based upon a plan that shall teach, or rather inculcate, organization, and at the same time educate its membership to one set of ideas ultimately subversive of the present wages system. The history of the knights of labor themselves, and the action of the general assembly at Detroit, are sufficient comments on this second principle. The order grew slowly at first, and, as time passed, the district, and finally the general assembly, were evolved to perfect and unify the organization of the local assembly. The first district assembly was organized in 1873, and the first general assembly met on New Year's day, 1878, at Reading. Mr. Wright notices the various general assembly meetings at Reading, St. Louis, Chicago, Pittsburg, Detroit, New York, Cincinnati, Philadelphia, Hamilton, Cleveland (a special meeting), and Richmond, and characterizes briefly the action taken at each. As to the strength of the order, he cites Mr. Powderly's testimony before the congressional committee in May, 1886, that it then numbered 500,000 members. At the time of the Richmond meeting last October, there were one hundred and sixty district assemblies and about nine thousand local assemblies. The total membership was then about 730,000. Mr. Wright believes that it is to-day about one million.

Mr. Wright mixes very little criticism or comment with his recital of facts, and we trust it is only because he wishes to avoid any appearance of discourtesy to those who have materially assisted him in collating his data. For, as to the attitude of sound and enlightened public opinion towards the knights of labor, there can be but one opinion. That there was a wide-spread sympathy with the organization and its aims at one time cannot be denied; and it is just as incontestable that this sympathy has been turned into disap-

pointment and disgust by the excesses of the various organizations, and the abuse they have made of their power. Without this sympathy and the support of public opinion, no great movement, labor or other, can be carried to a successful consummation. The spectacle of half a million or even a million men arrogating to themselves the title and privileges of laborers to the exclusion of the other sixteen or seventeen millions of wage-earners in the country, is ludicrous enough; but it becomes supremely so when this small minority endeavors to prevent any of the majority from obtaining such employment as the latter may desire, at such wages as they are willing to accept. It is this general principle, quite as much as the various excesses that have been committed, that has disgusted thoughtful men with the whole movement. The cowardice of political leaders, and the miscalled philanthropy of various members of the community, have permitted things which, without them, no organization would have thought of undertaking, much less of prosecuting successfully.

THERE IS NO SUBJECT which has for the sanitarian more interest than that connected with the great mortality among the young children of our large cities. And as the principal factor in this mortality is represented by the term 'summer diarrhoea,' it is to diseases of this nature that especial attention is devoted by those who have at heart the welfare of the young. Thirty-five hundred persons succumbed to this class of diseases during the past year in New York City alone, more than half of the number in the two months of July and August. To diminish this mortality is a task worthy of the best efforts of the philanthropist; and every contribution to this end, however insignificant, should be gladly welcomed, and made, so far as it can be, the basis for action. Dr. L. Emmett Holt of New York, in a paper recently read before the New York academy of medicine, has made a very valuable addition to our knowledge of the causes at work in the production of summer diarrhoea, and to the methods for its treatment. After a full discussion of these points, he presents the following conclusions: 1. Summer diarrhoea is not to be regarded as a disease depending upon a single morbid agent; 2. The remote causes are many, and include heat, mode of feeding, surroundings, dentition, and many other factors; 3. The immediate cause is

the putrefactive changes which take place in the stomach and bowels in food not digested, which changes are often begun outside the body; 4. These products may act as systemic poisons, or the particles may cause local irritation and inflammation of the intestine. In the treatment of the affection, Dr. Holt believes that antiseptics are of great value, especially naphthalin and the salts of salicylic acid.

THERE SEEMS TO BE a disposition, on the part of congress, to transfer the signal service bureau to the new department of agriculture and labor. General Sheridan approves this plan, and says, that, as a school of instruction, the bureau is not needed in the army, and would prove rather an encumbrance than an advantage: while, so far as its meteorological observations are concerned, these relate wholly to the interests of agriculture and commerce, and should be under the direction of some civil branch officer of the government.

PROF. WILLIAM JAMES of Harvard has a very clear description of the laws of habit, in the current issue of the *Popular science monthly*, that is at once scientific and philosophical. The old-fashioned literary treatment of habits is as far removed as possible from the point of view and method of Professor James. He shows us that 'habit' is a term of very wide application, and that the phenomena of habit in living beings are due to the plasticity — which means the possession of a structure weak enough to yield to an influence, but strong enough not to yield all at once — of the organic materials of which their bodies are composed. Thus a full account of habits implies some reference to physics as well as to physiology and psychology. Tracing briefly, then, the physiological and psychological side of habits, Professor James passes to the ethical and pedagogical considerations which concern them. He calls habit the 'fly-wheel of society, its most precious conservative agent,' and claims that "it is well for the world that in most of us, by the age of thirty, the character has set like plaster, and will never soften again."

The decade between twenty and thirty is found to be the critical one in the formation of intellectual and professional habits, while the period of life before twenty is the most important for the fixing of personal habits. From this it follows

easily that by education we must seek "to make automatic and habitual, as early as possible, as many useful actions as we can," and, conversely, to prevent the dropping into injurious habits. Professor James shows how unconsciously habits of mind are formed through the process of our daily routine, until some day we awake to the fact that we have acquired peculiar power or skill in some direction. The constant preaching of this truth would infuse new hope and ambition into many desponding workers.

THE EXCITEMENT AND ALARM which prevailed in this country last year and the previous one, in anticipation of cholera, have entirely subsided, and yet perhaps the danger of its appearance is as great to-day as it has been at any time in the past three years. Although frequent reference to its presence in Europe has been made in the daily press, its ravages have not been described as fully as the facts warrant. At Budapest there have been 1,329 cases with 586 deaths; at Fiume, 260 cases and 161 deaths; at Trieste, 896 cases and 557 deaths. In Japan during 1886 there were 153,930 cases, of which 100,492 were fatal. In Yokohama alone the cases numbered 3,021, and the deaths 2,273. In South America, cholera still exists at Montevideo and Mendoza; the U.S. consul, under date of Jan. 19, reporting that it has been officially declared at the former place. The disease still exists at Buenos Ayres, though it is said to be diminishing and of a less virulent form than heretofore. The presence of cholera on the west coast of South America, which has been announced by the press, still lacks official confirmation.

YOUTHFULNESS IN SCIENCE.

EVERY college instructor knows only too well how the more active-minded students are eager to grapple with the mightiest subjects, all in the untested pride of developing intelligence. Their themes are, 'The progress of democracy,' 'The comparison of French and English literature,' 'Solar energy,' 'The Darwinian theory,' 'The origin of mind;' in short, all the vastest problems, such as a lifetime is inadequate for. Most of us can gather from our personal recollections some examples of the foible. Youth does not know its measure. Only maturity, and not always even maturity, realizes how tiny and feeble is the force of the individual when it turns to attack the world problems, which stand more mysteriously

and longer than the sphinx to perplex and baffle humanity. The adolescent mind is confident; for it has never been beaten, since it has never been engaged in any real fighting. It proudly believes in its own success, and is but too apt to look disdainfully on great thinkers, because they left more to be thought. It glories in generalizations, and is gladly indifferent to the harassing details and preliminaries, with which, if it continues active, it will afterwards be chiefly and sensibly occupied.

The *young man* is often a would-be revolutionist. He is surprised that older and wiser and better men are so benighted. Let us not be misunderstood. The young man we are characterizing is the one in whom the faults his years are prone to are strongly accented. We have no intention of wholesale condemnation towards a class to which we have belonged, and therefore may be supposed to think of respectfully. If the unfortunate individual or type we are discussing betakes himself to science, he may do useful and praiseworthy work, but he is pretty sure to injure its meritorious part by adjuncts of misshapen generalization, and of criticisms very bad in taste and unjust in substance. His pages show a saddening spectacle of overgrown self-confidence, betrayed by the tone of expression, by the ill-repressed laudation of his own theories, and the bad-mannered fault-finding with others, perhaps merely because their observations, without which the young man could have done nothing, were not exhaustive of the field. Next follows pitiless criticism; the pedestal of flimsy logic is dashed away; the victim falls from his eminence. The specious argumentation is reft, and the man's ignorance is exposed nakedly. Last comes the cruel abasement, all the worse to bear because it is the public sequel of elation. And still the young man must be grateful if the late lesson can be learned by his aching and repentant mind. Would that the fire of the soul always purified, and never consumed!

PROHIBITION.

INTERFERENCE with the voluntary actions of people is to be deprecated, except when such actions trespass on the rights of other members of the community.

A chemical factory, emitting noisome fumes, must not be established in the midst of a town or city, or measures must be enforced against it to prevent the contamination of the surrounding air; a boiler-factory, with its din of rivet-hammering, must not be suffered to disturb the peace of a residential neighborhood; a gunpowder-factory must

not be allowed to endanger other properties by its proximity; a graveyard must be kept away from centres of living population. These interferences with the voluntary actions of factory and graveyard owners are justified by the fact that the interdicted operations are trespasses on the rights, because baneful to the health or comfort, of the community.

Is there any similar justification for the prohibition of the manufacture or sale of alcoholic liquors?

We know that use is very apt to degenerate into abuse of such commodities; and we know that more than half of the immorality that afflicts society, and of the crime that fills our prisons, is directly traceable to the abuse of alcoholic liquors. We know also that the heaviest portion of the burdens on tax-payers—the cost of protective, detective, judicial, reformatory, and punitive establishments—is largely owing to the same cause. Everybody admits, therefore, that society would be justified in doing whatever is requisite to protect itself from the gigantic evils which spring from the liquor traffic.

Here, however, the policy now widely advocated diverges from the line of justifiable interference. Prohibition of manufacture or sale is not the proper protective policy. This interferes with the voluntary action equally of those who innocently use as of those who criminally abuse. No notice need be taken of the bigot theory, that innocent use of alcoholic liquors is impossible. Let us grant a place in the world for every thing to be found in it, and for every production of man's hands. Use and abuse are possible for all things.

What, then, is the proper line of social action?

Society does not, and can not, prevent the playing of games of chance by those who choose to waste their time and means in such demoralizing pursuits; but society does interfere with the business of the gambler, the card-sharper, the lottery-ticket seller, etc. Society does not seek to stop, by futile prohibitory measures, the prevalence of other forms of 'social evil,' but society does prevent the flaunting of immorality before the public eye, and the use of the streets for its advertising purposes.

So in reference to the liquor traffic. No attempt need be made, or should be made, to interfere with manufacture or sale; but the most absolute prohibition should be laid on the *business* of selling liquor 'to be drunk on the premises.' Saloons and bar-rooms are evil, and only evil, and that continually.

If a man wants beer or brandy, let him buy it as he does beef or bread, and by due measure of

pint or gallon, as he does solid provisions by ounce or pound. And let his purchases of liquor be delivered at his home, as openly as his meat and vegetables are. What would be thought of the man who should pack his fill of beefsteak and oysters within his own waistcoat, and leave his family to dine, as best they could, on bare potatoes? If the beer is good for the husband, a little of it would be equally good for the wife?

No articles of consumption are so tampered with by deleterious adulterations as the staples of the bar-room. No articles are sold at such a disproportion between the wholesale cost and the retail price. Nothing measured by the yard or weighed by the pound is so vague in quantity as the saloon 'glass.' People sneak behind the lattice-screen, and submit to the extortionate dishonesty for the sake of the privacy of their selfish indulgence. In the higher order of such places the patrons are further attracted by objects of luxury and sensuality. Gas, gilding, mirrors, statuary, and paintings are lavished on the surroundings. The wretched tippler's home is, of course, dull in comparison with this brilliant vestibule to the temple of vice.

Prohibition and local option are the measures most widely recommended for the cure of the drink-habit. But the true remedy has not been thought of by the advocates of these worse than ineffective panaceas. The social curse can only be stopped by stopping the liquor-supply at the point where alone it is capable of legislative control. Shut the saloons. Allow no liquor to be sold anywhere to be drunk on the premises. This is the grand summary of a grand revolution.

This 'prohibition' leaves to every man the due exercise of his personal freedom: it prohibits only the manufacture of drunkards, paupers, tramps, and criminals.

The spiders who fatten on the weak frequenters of their glittering nets of doom would have to turn to other employments. *They* would not be the liquor-sellers of the future. These would be of the class of ordinary honest tradesmen who put a fair price per definite quantity on a definite quality of their wares. Purchasers would be protected as to quality by certified inspection, and as to quantity by the compulsory use of measures in selling. Cut away by these provisions, the source of dishonest profits from the business of the bar-room, and even the proprietors of such establishments would speedily relinquish the traffic.

Prohibition of the *use* of alcoholic liquors has never succeeded — never can succeed; for it is a tyranny from which every independent mind revolts. If a man will play the fool with his brains

and his means, society cannot stop him; but it ought not through its licensed agents to facilitate the process. It should, moreover, provide an easy means of family protection from the consequences of drunkenness. Legislation can accomplish this, and nothing more would be necessary.

To stop the sale of alcoholic liquors for consumption on the premises would inconvenience nobody. Phials of any capacity might be obtained for use at home. And the gilding and glitter of the saloon might still be available to render attractive the tea-room, coffee-room, and reading-room, where families as well as individuals might resort for the cup 'which cheers but not inebriates.'

B.

PETER'S ATTACK ON PASTEUR.

THE discussion in the Paris academy of medicine, which originated in Professor Peter's recent paper on death by hydrophobia after preventive inoculation, was concluded at the last meeting (Jan. 18). Professor Peter spoke again upon the subject, but in much milder language, and his remarks may be summarized as follows:—

When death takes place after preventive inoculation, the defenders of Pasteurism recur to an alibi or to extenuating circumstances instead of confessing the truth. For instance, they argue that death was due to some other cause, such as uraemia, meningitis, or albuminuria, but not to hydrophobia. In other cases they admit that hydrophobia is the cause of death, but they explain it by stating that the patient did not apply for treatment until it was too late. M. Peter does not accept these excuses, and bluntly says, that, if patients die after having submitted to preventive inoculation, their death is due to the inoculation, entirely ignoring the effects of the rabid animal's bite. Pasteur's method, according to M. Peter, is an ingenious one; but it should not be applied to man, especially the more recent method of intensive inoculation. The old method, he admits, is harmless though useless; the new method, he claims, is harmful, even murderous. To it and not to the bites of the rabid animals, he attributes the recent death of patients with hydrophobic symptoms, after preventive inoculation.

M. Brouardel, in a short matter-of-fact address, said that M. Peter's arguments were utterly illogical, and concluded by giving the statistics of results already achieved at Odessa, as follows: out of 101 cases treated by the ordinary method, there were 7 deaths; out of 35 cases treated by the mixed method, 1 death; out of 140 cases treated by the intensive method, *not one death*. This disposed of the charge that the latter method is mur-

derous. M. Vulpian stated that out of 136 cases of bites inflicted in the face by animals known to be rabid, treated by the ordinary method, there were 10 deaths; out of 50 similar cases treated by the intensive method, *no deaths*. As to the charge that the method is useless, that is refuted by statistics already familiar to those interested in the subject.

M. Vulpian spoke at some length on the possibility of encountering the paralytic form of hydrophobia in man under ordinary conditions, mentioning some cases which prove that it does sometimes exist where the person bitten by rabid animals has not been subjected to preventive inoculation.

The discussion is ended for the present, but it will doubtless begin again at some future time. Though M. Peter was somewhat moderate in his remarks at the last meeting of the academy, he does not seem to possess the spirit of scientific criticism, perceiving neither the weight of the arguments advanced in opposition to his assertions nor the fallacy of some of his own.

As M. Pasteur has been accused, though wrongfully, of concealing the results of his treatment, it has been decided to publish statistics monthly, instead of quarterly as heretofore. They will appear in the *Annales de l'institut Pasteur*, which will be published under the direction of M. Duclaux.

ST. PETERSBURG LETTER.

THE geographical event of the season is the return of Potanin, who is expected here in time to attend the annual meeting of the Russian geographical society this month. A large map of the route travelled by him is being prepared by Colonel Bolschew, the military cartographer. The previous travels of Potanin were especially noteworthy on account of his ethnological and anthropological studies; but the chief importance of the expedition from which he now returns lies in the geographical studies made by him in the higher parts of Asia, not only because he has visited regions heretofore untrodden by civilized man, but also because of the accuracy of his observations in those regions. The latitude and longitude of sixty different points have been ascertained, and the barometrical observations of the expedition will permit of a tolerably accurate determination of heights. There were 4,500 versts of accurate survey made, and this in the parts least known, while in the more thickly settled regions approximate surveys only were found possible. The co-operation as topographer of Skassi, who accompanied Severtzow on many of his travels, contributed much to these results. The travellers

were exceedingly well received by the Chinese authorities, who furnished them with guides and all necessary information. The most important work was done on the journey from Koko-Nor directly north to Kiachta by way of the Gobi desert. The river Ersin-Göl was followed over a great part of its course to the point where it falls into Lake Soyok-Norinto. Farther northward four ranges of mountains were found.

The second in importance of the Russian scientific expeditions of the past year was the so-called Chan-Tengri expedition, headed by Ignatiew, who visited the glaciers of that mountain. The results of the expedition are not yet made public. He travelled through the Muzart pass, and found it to be as difficult of access as it was generally believed to be. The botanist Krasnow took a more easterly road, and, traversing the Bedel pass, went to Utsch-Turfan. Much is to be expected from the latest work of this young naturalist, if we may judge by what he has already accomplished.

The secretary of the Geographical society, A. W. Grigoriew, recently attempted to visit the Solovetz Islands in the White Sea, desiring to make observations on the depth and temperature of the waters there, but, as he could find no ship to transport him thither, did not succeed in reaching the islands. He made an excursion, however, to the waterfalls of Kiwatsch and Por-Porog, from Petrozavodsk on Lake Onega. The position of the latter waterfall, as well as of its river, is not shown on any map as yet. There is a great lack of astronomically determined points and of accurate surveys in that part of Russia, and there is but little hope of any thing being accomplished there at present by the military surveyors. It would be a good field for private enterprise, as the region may be easily reached from St. Petersburg by means of the steamers plying on Lakes Ladoga and Onega. It is a picturesque country, with numerous lakes and waterfalls, and affords excellent salmon and trout fishing.

Some new data on the topography of the country between Vologda and Archangel were obtained during the past summer by Kusnezow. The greatest elevation on the watershed between the Volga and the Dwina was found to be 756 feet. Thus the topographical work of Russia is slowly advancing.

The Geographical society has under consideration some short practical instructions to explorers, the main point aimed at being to draw their attention to the alleged gradual drying-up of the inland waters of the Asiatic continent. It has already been mentioned that Jadrinzew, on comparing last-century maps with those of recent years, finds that the lakes of the Baraba steppe,

such as Tschany, for instance, have shrunk to half their former dimensions. On personal examination of those lakes, he found many traces of a recent decrease in their waters. Russia has so many lakes, that the study of their physical geography is especially important.

The pendulum ordered last year has been brought from Hamburg to St. Petersburg by Professor Lenz. It has been carefully tested, and Professor Bredichin, the astronomer, will make determinations of gravity with it next summer in the vicinity of Moscow.

Among the recent changes in the *personnel* of the Geographical society, the following may be mentioned: General Stebnitzky has been chosen president of the mathematical section, and Prof. W. Lamansky of the ethnographical section. The former is known by his excellent geodetical work in the Caucasus and the eastern part of Asia Minor, and also by his works on local attraction. The latter gentleman is one of our most eminent Slavists.

The eclipse of Aug. 19 will be visible over a great extent of Russian territory. The question as to the best methods of its observation, which was discussed last spring by the Physico-chemical society, is now being considered by the Meteorological commission of the Geographical society, which will occupy itself mainly with observations on pressure and temperature during the eclipse. It has not been decided what expeditions will be equipped for the purpose, and only two points of observation have as yet been determined upon. One or two astronomers will be stationed on the estate of General Maiewsky, in the district of Tver, where an astronomical observatory is established; and Professor Bredichin, with two English friends, will take observations on his estate in the government of Kostroma. It is not as yet known whether or not the Pulkowa observatory will send out a party. The visibility of the eclipse on land will be unusually great; and the country west of Lake Baikal, where the totality will be seen, is tolerably well settled; and to Tomsk, at least, the railroad and steamboat communications are good. The time of the year is favorable, and the hour, 7 A.M., is such that the morning fogs will have been dissipated.

The question as to the new chair of geography in the Russian universities is under discussion. The universities of Moscow, Kharkow, Kasan, and Odessa have already sent their opinions to the ministry of public instruction, that of St. Petersburg is still considering the subject, while Prof. A. Woeikof has been sent to different countries of Europe on a scientific mission in connection with the matter.

The Academy of sciences has recently elected to membership two chemists and a mathematician. The former, Professor Beketow, of Khartow, and Professor Beilstein of the Technological institute of St. Petersburg, are well known abroad; the latter, Dr. Marcow, of St. Petersburg, is a young man of great talent, who occupied the chair of Professor Tschebischew after the latter left the university.

Among recent scientific publications may be mentioned that of M. A. Rykatschew on the freezing and opening of rivers and lakes in Russia. The author, with the assistance of three naval officers, — Kowalsky, Maliarewsky, and Filenius, — has collected a great quantity of material which he has used in a very able manner. For the dates of opening of the rivers, lakes, etc., he has availed himself of observations at 907 different points, and, for those of their freezing, 890 points. Some of these observations extended over long periods, those relating to the Neva at St. Petersburg, Vistula at Warsaw, Dwina at Archangel, Angara at Irkutsk, Dïna at Riga, and Kïro at Storkïro, reaching back over a hundred years; the Onega at Onega, Bielaya at Ufa, Volga at Saratov, Obi at Barnaul, Sookhona at Ustiug-Weliki, Sysola at Ust-Sysolsk, and Yenisei at Yeniseisk, more than eighty years. The following table shows the number of available observations as to time of opening and freezing at the points mentioned during the number of years given in the first column:—

	Opening.	Freezing.
80 years or more	13	11
50 to 79 years.	14	10
30 " 49 "	39	30
20 " 29 "	136	119
10 " 19 "	241	239
Less than 10 years.	464	408

In the book under consideration the observations for each year are given separately. The results are also graphically shown by three charts or diagrams, — one for the date of opening, one for that of freezing, and one for the number of days the rivers are frozen. As might be expected, there is nearly always a retardation; that is, the rivers do not freeze over until some days after the temperature has fallen below 0°, and do not open until some days after it has risen above 0°. This retardation is greater for large rivers than for small ones. The explanation of this difference is, that a longer time is required to chill a large body of water than a smaller one; and, on the other hand, the melting of the snow, and the consequent snow-water, sooner affects the ice of a small river than that of a larger one. But

when once begun, the thawing and breaking-up of the ice on a large river proceed more rapidly than on a smaller one. This retardation is greater on the Volga than on any other river in Russia. On the major part of its middle and lower course it remains unfrozen for more than thirty days after the temperature has fallen below 0°, and it does not open in the spring until at least fifteen days after the temperature rises to that point.

To-day, at the yearly meeting of the Academy of sciences, a commemorative gold medal was presented to Gen. N. M. Prjevalsky. O. E.
St. Petersburg, Jan. 10.

NOTES AND NEWS.

At the last meeting of the board of regents, two assistant secretaries were appointed to aid the secretary in the work of the Smithsonian institution. Prof. S. P. Langley of Alleghany City, Penn., was appointed as assistant secretary in charge of exchanges, publications, and the library; and Prof. G. Brown Goode, as assistant secretary in charge of the national museum.

— The Cincinnati society of natural history presents an unusually attractive course of free popular scientific lectures the present season. This is the sixth course, and the subjects are as follows: 'Climate, plant-life, and consumption,' Dr. W. A. Dun; 'Deep-sea explorations,' Joseph F. James; 'The moon,' J. G. Porter; 'The retreat of the ice and the evolution of Lake Erie,' E. W. Claypole; 'The U. S. fish commission,' Herbert Jenney; 'Forestry,' R. H. Warder; 'Sun-spots,' Amos R. Wells; 'Gas as a fuel,' N. W. Lord; 'Glaciers and earthquakes,' J. W. Hall; 'Primeval man,' E. D. Cope; 'Bird-life,' F. W. Langdon. The first lecture was given on Jan. 14, and the others follow at intervals of one week. The society is unusually active this year, and is in a prosperous condition. A lyceum for young people has been inaugurated, and ninety names are now enrolled. The object is to interest children in the study of natural history, and there is every reason to believe the plan will succeed. In addition to these, a course of lectures on physiology, by Dr. C. E. Caldwell, to the school-teachers, is being given. Sixty have been enrolled, and each lecture has been well attended.

— The recent election in the California academy of sciences held in San Francisco resulted in the election of the following officers: president, H. W. Harkness; first vice-president, H. H. Behr; second vice-president, G. Hewston; corresponding secretary, H. Ferrer; recording secretary, Charles

G. Yale; treasurer, John Dalber; librarian, Carlos Troyer; director of the museum, J. C. Cooper; trustees, Charles S. Crocker, T. P. Madden, J. M. McDonald, E. L. G. Steele, S. W. Holladay, Dr. Hayes, and E. J. Molera. Prof. George Davidson, who had been president of the academy for fifteen years, was not re-elected. By the will of the late James Lick, the academy will receive two hundred thousand dollars, a portion of which will be devoted to the erection of a new building.

— Consul Bissinger, at Beirut, in a recent report to the department of state, says that the preliminary and experimental borings in the extensive oil regions on the littoral of the Red Sea are being pushed forward with unabated vigor by the Egyptian government. An efficient staff of geologists, mining engineers, and other experts from the United States, Great Britain, and Belgium, are busily at work, ably seconded by experienced assistants from the American and Russian oil-fields. Improved machinery and mechanical appliances of every description have recently been landed at the newly constructed harbor situated about two miles north-north-east of the petroleum wells. These wells are pools of a black-looking, bitumen-like substance, which emit an unmistakable odor, and scent the desert air for miles around. The whole district, from Gensah in the south to over twenty miles north of Djebel Teyt, presents every indication of the presence of oil; and when it is remembered that oil was 'struck' at a moderate depth at the first boring, and a 'flowing well' was produced at a greater depth at a subsequent boring, there is every reason, it is claimed by those having devoted much time and thought to the subject, to believe that the fields contain petroleum deposits in such abundance as to fully justify the immense expenditures ventured in the elaborate preliminary operations by the Egyptian government. A more recent report announces that well No. 1, at Gensah, is now spouting pure, heavy petroleum at a depth of 125 feet.

— The house library committee has made a favorable report on the resolution providing for a joint committee of five senators and eight members to consider the expediency of holding, in 1892, an international exhibition of the industries and products of all nations, to be held at Washington in 1892, to commemorate the four hundredth anniversary of the discovery of America.

— An amendment will be added to the sundry civil bill in the senate, constituting the secretary of state, the secretary of the Smithsonian institution, and the librarian of congress, a com-

mission to report to congress the character and value of the historical and other manuscripts belonging to the government, and what method and policy should be pursued in regard to editing them.

— The Yellowstone park bill was passed by the senate last week. It defines the park boundaries, places it under the exclusive jurisdiction of the United States, and sets the territory apart as a public park and pleasure-ground for the benefit of the people. The secretary of the interior is authorized to make rules for the management and care of the park, and provision is made for a detail of troops to protect its beauties. All hunting of wild animals or birds, except animals dangerous to human life, fishing with nets or traps, is prohibited, and violations are punished by fine and imprisonment. The President is to appoint a commissioner, who is to reside in the park, and act as a justice of the peace in placing offenders within the jurisdiction of a district court.

— One of the most complete and most valuable collections of Indian folk-lore yet published is the volume of 'Indian traditions of north-western Canada' (*Traditions Indiennes du Canada Nord-west*), which has just appeared in the series of '*Les littératures populaires de toutes les nations*' (Paris, Maissonneuve Frères et Ch. Leclerc). The author, the Rev. Emile Petitot, who was for twenty years a missionary among the tribes of the far north, is well known to scholars by his excellent comparative grammar and dictionary of the Déné-Dindjî dialects, and by many other useful works on the philology and ethnography of north-western America. The present collection is chiefly devoted to the legends and traditions of the far-spread Athabascan tribes — styled Déné-Dindjî by the author — occupying the vast region between the Eskimo of the northern coasts and the Algonquin and Dakota tribes of the Red River and Saskatchewan countries on the south. The stories are given in the bald simplicity of a literal version, with no attempt at literary garnishing, — a fact made clear by the addition, in some cases, of the original, with an interlinear translation. Even in this rude guise, evidence of no small imaginative power is frequently apparent. What is chiefly remarkable is that (with a very few exceptions) these Athabascan legends differ totally, in their incidents and their mythology, from the folk-tales of their neighbors, — the Eskimo on the one side, and the Algonquin and Dakota tribes on the other. The exceptions are in a few of the stories of the more southern tribes, which differ widely from the rest, and are clearly borrowed from the Algonquin Crees. This distinct character of the Atha-

bascan legends confirms the fact, which has been noticed by Major Powell and other careful observers, that the Indians of each linguistic family have their own special mythology, different from all others, — a fact certainly of great and far-reaching importance in ethnological science. M. Petitot has some fanciful theories about a connection between the Indians and the ten tribes of Israel, and also — what seems rather inconsistent — about the reference of some of the legends to the glacial era, the change in the earth's axis, and other primeval events. As in the case of that learned and estimable but somewhat visionary writer, the late Abbé Brasseur de Bourbourg, — of whom our author much reminds us, — readers can accept the valuable facts which he honestly gives them, without troubling themselves about his peculiar hypotheses.

— Following the monograph on 'Co-operation in a western city,' by Albert Shaw, Ph.D., the American economic association announces the publication of a history of 'Co-operation in New England,' by Edward W. Bemis, Ph.D., to be issued Feb. 5. Dr. Bemis has made a study of co-operation, and this work will be a guide for co-operators, and contain many facts to interest the student of the labor problem. Copies may be had of Dr. Richard T. Ely, secretary, Johns Hopkins university, Baltimore, Md.

— Mr. G. W. Hill of the Nautical almanac office, Washington, was awarded the gold medal of the Royal astronomical society, at the December meeting, for his laborious and masterly researches upon the 'Lunar theory.'

— The Royal society of New South Wales offers its medal and a money prize for the best communication (provided it be of sufficient merit) containing the results of original research or observation upon each of the following subjects: — Series vi. (to be sent in not later than May 1, 1887): No. 20, 'On the silver-ore deposits of New South Wales,' the society's medal and £25; No. 21, 'Origin and mode of occurrence of gold-bearing veins and of the associated minerals,' the society's medal and £25; No. 22, 'Influence of the Australian climate in producing modifications of diseases,' the society's medal and £25; No. 23, 'On the Infusoria peculiar to Australia,' the society's medal and £25. Series vii. (to be sent in not later than May 1, 1888): No. 24, 'Anatomy and life-history of the Echidna and Platypus,' the society's medal and £25; No. 25, 'Anatomy and life-history of Mollusca peculiar to Australia,' the society's medal and £25; No. 26, 'The chemical composition of the products from the so-called kerosene shale of New South Wales,' the society's

medal and £25. Series viii. (to be sent in not later than May 1, 1889): No. 27, 'On the chemistry of the Australian gums and resins,' the society's medal and £25; No. 28, 'On the aborigines of Australia,' the society's medal and £25; No. 29, 'On the iron-ore deposits of New South Wales,' the society's medal and £25; No. 30, 'List of the marine fauna of Port Jackson, with descriptive notes as to habits, distribution, etc.,' the society's medal and £35. The competition is in no way confined to members of the society, nor to residents in Australia, but is open to all without restriction. No award will be made for a mere compilation, however meritorious in its way: the communication, to be successful, must be either wholly or in part the result of original observation or research on the part of the contributor.

— The annual report of the director of the Harvard observatory, which was presented to the visiting committee on Dec. 7, has just been printed as a part of the report of the president of the university. Professor Pickering is to be congratulated upon the highly satisfactory financial basis on which the observatory is at length placed, through the munificence of the late Robert Treat Paine. About half of the Paine bequest, or \$164,198, is now available; and the endowment of the observatory, which was \$164,000 in 1875, and \$227,000 in 1885, has now risen to \$398,046. A share of the increased funds must be applied, for the present, to needed repairs, and to the publication of observations already made. The 15-inch equatorial is to have a new mounting, and Professor Pickering hopes that at no distant day means may be found for replacing the observatory building by one better adapted to the requirements of modern astronomy. The report details the work of the various instruments, particular attention being given to the subject of photometry, as in past years. The most important new work of the observatory is in the field of stellar photography. For this investigation Mrs. Draper has lent the 11-inch photographic lens employed by her husband, the late Dr. Henry Draper, at his observatory on the Hudson, and has provided means for its new mounting, as well as for the prosecution of the researches to which it is to be devoted. We regret to note the resignation of Professor Rogers, the first assistant for the past fifteen years, and the observatory suffers a second loss in the resignation from its staff of Mr. S. C. Chandler, jun.

— During the past week the U. S. fish commission made the following distribution of California trout in the localities given: 300 yearling trout were placed in Swinks Lake, near Scottsboro,

Ala.; 175 yearling in Sauters Creek, Ala.; 175 two-year-old in Paint Creek, Ala.; 175 yearling in Bear Creek, near Benton, Ala.; 75 yearling and 100 two-year-old in Flint River, near Brownsboro, Ala.; 175 one-year-old in Crow Creek, Ala.; 175 two-year-old in Lookout Creek, near Rising Fawn, Ga.; 178 two-year-old in the South Fork of the Chickamauga River, near Chattanooga, Tenn. The next distribution of trout will be made during the coming week, and will cover the states of Ohio, Indiana, and Michigan.

— It has been settled that the gift of President White's valuable historical library to Cornell university is to be followed by the erection of a large library building by the college authorities.

LETTERS TO THE EDITOR.

*.*Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Sources of nitrogen assimilated by growing plants.

IN my address before section C at Buffalo last August, I gave a *résumé* of the investigations made up to that time in respect of the sources of nitrogen consumed by plants. The general conclusions of this paper were given in the abstract of the address, which appeared in *Science*. Since that time two important investigations have been published, and I feel that I ought to add an abstract of these as a supplement to the one you made.

Atwater (*Amer. chem. journ.*, viii. Nos. 5 and 6) has shown, in two papers recently published, that in many cases there is a loss of nitrogen in germinating plants: in other words, nitrogen that may be present in a nitrified form, or in a form easily nitrified, may escape assimilation by being set free by the denitrifying ferment described by Gayon and Dupetit and Springer. The importance of this fact seems to have been overlooked by most investigators, and the intimate relation it has to all studies of nitrogen-assimilation will not be denied by any one. Generally it has been assumed, that, if plants show an amount of assimilated nitrogen equal to that in the seed and food supplied, it is a proof that no free nitrogen has been consumed, either directly or indirectly. But if it should be established that much assimilable nitrogen in the seed or food may be lost, then the above assumption cannot be true. As a contribution to the study of this interesting problem, Atwater's papers are worthy of careful consideration.

Hellriegel (*Zeit. d. Ver. f. d. Rübenzucker-Industrie*, November, 1886) has lately published a paper in which he shows that an active nitrifying ferment may prepare unassimilable nitrogen for plant-food. While the Gramineae appear to possess little capability of being nourished by the nitrogen that can be derived from the atmosphere, the Papilionaceae possess this power to a remarkable extent. To a sterilized earth free of nitrogen was added a few cubic centimetres of an aqueous extract of earth taken from a field where peas were in active growth. Peas were sprouted in pots of nitrogen-free and sterilized earth, and continued to grow until the nitrogen-supply of the seed was exhausted. They all then passed into a state of starvation. To some

of these pots the earth-extract mentioned above was added. In a few days the plants took on a new growth, totally out of proportion to what could have been caused by the minute quantity of combined nitrogen contained in the extract. The plants in the pots not receiving this remained in a dying condition. The micro-organisms in the case just mentioned inhabit a small bulb which appears on the roots of the plant, and in this laboratory the transformation of the nitrogen appears to take place.

These later investigations lend emphasis to the statement I made in my Buffalo address: "These views of chemists so distinguished, based as they are on a series of experiments, extended and laborious, even if not above criticism, must command our most serious attention. They expressly admit the possibility of the use of the free nitrogen of the atmosphere, but are careful not to literally affirm it."

H. W. WILEY.

Washington, Jan. 28.

Halos seen at Denver.

On the afternoon of Friday, Jan. 7, and in the evening, there was a brilliant display of halos, etc., at Denver. I have been told that it began at about 1 p.m., but I did not see it until 2.30 p.m. At that time the sky was of a milky hue, from the presence of the ice-clouds. The parhelic circle, passing through the sun, parallel to the horizon, could be traced entirely around the sky, except in the immediate vicinity of the sun: parts of it were at times temporarily obscured by small, swiftly passing clouds. The two principal parhelia, 22° distant from the sun, were very bright, and secondary parhelia were seen at a distance of 120° . The halo of 22° radius, encircling the sun, was incomplete. In the zenith was a faint circle of red light about 20° in diameter. The quadrant nearest the sun was expanded into a magnificent lune 2° wide at the broadest place: it displayed the prismatic colors from red to violet, the red border being toward the sun. As the sun descended toward the west, the lune grew narrower and longer, being only 1° broad at 3.30 p.m. During the next ten minutes, clouds rising from the western horizon obscured the sun, and with it the parhelic circle. The lune was visible for a short time after the sun had disappeared, but at 3.40 p.m. it too had vanished. By looking toward the west during the display, the ice-crystals near the earth's surface were plainly visible, and had the form of slender needles.

In the evening the sky seemed clear, and the moon, lacking two days of being full, shone brightly. The paraselenic circle was complete, and beautifully contrasted with the dark sky. It was $1\frac{1}{2}^\circ$ broad opposite the moon, and grew narrower as it approached that luminary. It could be traced almost up to the moon's disk. At 8 p.m. the halo of 22° radius about the moon was very distinct: at the highest and lowest points there were rudimentary tangent arcs, and a consequent increase of brilliancy at those points. The paraselenae were not at the intersection of the halo with the paraselenic circle, but on the latter about 3° or 4° outside of the halo. The inner edge of the halo was a red circle, but the outer edge was an ill-defined ellipse, the major axis of which stretched between the two paraselenae, while its minor axis coincided with the vertical diameter of the red circle. The space between the inner and outer edges

was filled with milky light. At 8.30 p.m. the paraselenae had disappeared. Secondary paraselenae were seen at distances of 120° from the moon. At 9 p.m. a bright arc having a uniform breadth of 3° , and exhibiting prismatic colors, was seen in the southeast, being a portion of a circle of about 40° radius, in the centre of which lay the moon. It passed through the triangle of conspicuous stars (δ , ϵ , η) in Canis Major. At 9.30 p.m. all the circles except this one had vanished, and at 10.30 it too had gone. I have been told that after midnight the entire system of circles re-appeared. There was no lune in the zenith before midnight, or after, as far as I have been able to learn. It was possible to see the ice-crystals floating down by looking toward the moon. I regret that I had no instruments for making accurate measurements of the angular distances which I estimated.

H. A. HOWE.

Denver university, Jan. 28.

Consumption among Indians.

In *Science* for Jan. 21 (p. 76) reference is made to a supposition that "it is change of diet which is the most potent remote cause of consumption among the Indians." Another cause, in my opinion, is change of dress. Before he came under the influence of civilization, the Indian was not clothed in garments that would interfere with the free action of the pores of the skin. If a live rabbit be dipped in a solution of glue, so as to cover its body with a coating impervious to air, it is surprising how quickly the frequency of the respiratory movements increases, showing that the work of the lungs is increased by depriving the skin of free access to the air.

The process of civilization has a somewhat similar effect upon the Indian, though to a less degree. One of the first lessons in the effort to civilize him teaches him to envelop himself in clothing of a kind that tends to impede and impair the normal action of the skin, the pores of which are organs of excretion, — a mechanism by which morbid and waste material may be thrown out of the system. Deprived of the assistance afforded under previous conditions by the skin, the work of the lungs is greatly increased, rendering them peculiarly susceptible to bronchitis and pneumonia, — ailments which are commonly the forerunners of consumption. If we accept the theory of Koch, they make the lungs a suitable habitation for the bacillus tuberculosis.

If we study the pre-tubercular history of man, we find his clothing in those times far different from what it is to-day, when the percentage of death from consumption reaches so high a figure.

The fact that the mortality from consumption among the Indians immediately after they come under the influence of our civilization is so much greater than among the whites proves the truth of what I have advanced. We have had our liability to consumption from overworked lungs tempered by hundreds of generations of ancestors habituated to the use of clothing, so that our risk is much less.

The facts underlying these views are, 1° , the lungs are not the only organs of respiration; 2° , they are important excretory organs, and, like the kidneys or liver, they may be overworked; 3° , the skin, in its natural condition, as an organ of respiration and excretion, is a most important adjunct of the lungs.

HAL. C. WYMAN.

Detroit, Mich., Jan. 22.

A plea for civilian control of the U. S. weather-bureau.

A recent discussion of the value of the signal-service weather-predictions was begun in the *Boston Transcript* by a letter from a Boston lawyer. A portion of the letter is here given:—

"To the editor of the *Transcript*. It would seem that it is time to call for a termination of the farce of publishing the official weather-prognostications, at least so far as the neighborhood of Boston is concerned. Whoever is in the habit of looking in the morning paper to find what weather is promised for the day must have been much impressed of late with the faculty for getting it all wrong, which the Washington bureau appears to possess. [Here follows a whole list of notable failures within a month.] In conclusion, I will only ask whether a 'weather-bureau' which produces such failures as these is worth the cost of its maintenance? It may claim, indeed, that it has sometimes prophesied right, but a man in a dark closet could not possibly have guessed always wrong."

A number of letters followed this from different persons, all of which agreed in regard to the inefficiency of the signal-service predictions; and this, I think, voices the general sentiment of the New England people. I had so frequently heard people last year, when they were speaking of the signal-service predictions, say, 'Anybody could guess at the weather,' that the question presented itself, Why was it, that, in face of the fact that the official bulletins claimed eighty or even ninety per cent of successful verification, the average New Englander had arrived at the conclusion that the signal service merely guessed at the weather? It occurred to me that the popular measure of success was not what per cent some arbitrary method of verification gave, but rather how much better were the predictions than those which could be made by people ordinarily without instruments of any kind?

In order to test this, I had Frank Brown, an intelligent steward of Blue Hill observatory, make weather-predictions at sunset for the following twenty-four hours on each day from last March to July inclusive. These predictions I recorded when made, and carefully verified them in accordance with the rules given by the signal service to voluntary observers for verifying the signal-service predictions. I then compared his predictions with those of the signal service, verified in the same manner, and I found that each month he obtained from three to ten per cent higher success than the signal service.

In order not to confine the test to one person alone, I asked Mr. and Mrs. Davenport, intelligent persons living near Blue Hill, but who claimed to know nothing about the science of meteorology, to make weather-predictions during the month of June. These predictions were made at sunset for the twenty-four hours beginning at midnight, and were based on the appearance of the sky alone without any instruments. These predictions were received and recorded when made, and the end of the month showed that the predictions of each, though slightly different, were eighty per cent verified, while the signal-service predictions during the same time were only seventy-seven per cent verified.

These results clearly show why many people do not regard the signal-service predictions as of value.

It would occupy too much space to attempt to show why the signal-service method of verification makes them appear to gain such high success: suffice it to say that many of the cases which, according to the rules adopted, must be recorded as successful, are most glaring failures.

During the last few months I have endeavored to ascertain the causes of the many failures in New England of the signal-service 'indications;' and I find in the position of New England between the lakes on one side, and the ocean on the other, I think, a fruitful cause of the failures of the signal service. We find from local observations here in Boston, that, when a storm approaching from the west passes over, the sky begins to clear almost immediately after the passage of the line of minimum pressure. But on a synoptic chart it is frequently found, that even though the centre of least pressure is off on the ocean, it is raining or snowing at certain lake stations, such as Marquette, Oswego, etc.; and the explanation is apparent, for the circulation of the wind is such as to drive the air across the great lakes to these stations, where it arrives laden with moisture and ready for precipitation. The signal service, ignoring all local influences, and basing their predictions on the eastward movement of weather-changes, predict over and over again rain or snow for New England, which, under such conditions, seldom arrives.

Again: an area of high pressure, approaching New England from over the Lakes, may be attended by fair weather; but immediately it arrives over the Gulf Stream, and begins to force air on the land from the north-east or east, rain begins; and numerous failures of the signal service can, I think, be traced to this cause.

I have not confined my studies of the signal-service predictions to New England, but have closely watched them over other parts of the country; and I have become convinced that the predictions are based almost entirely on the eastward movements of weather-changes, with but little regard to local influence, or to the facts elicited by the splendid researches during the last ten years of Loomis, Van Bebber, and a host of others. In other words, the science of weather-predicting in the United States has not advanced a step since the days of Joseph Henry and Espy. This, I believe, has largely if not entirely resulted from the military control of the weather-bureau. Conventional routine, and action without questioning, is a necessary part of military training, and it has produced its fruits in a blind following of a few rules and a consequent want of advance in military weather-predictions. Not only does the military organization fail to give the best results which might at present be obtained, but I believe it is immensely detrimental to the advance of meteorology to a higher and more scientific position. In Europe the men in charge of the weather-services are scientific men, who not only do their present work well, but, sustained and enthused by their work, are investigating the difficult problems which present themselves, and thus pushing meteorology to a higher and more scientific stand-point.

Nor do I think the detriment of the military organization ends with the predicting department. I have known personally a number of bright young men, intensely interested, and trained in science and scientific methods, who were kept out of the signal service on account of the military organization.

These men were aware of their ability to earn an ample sustenance in the world, and did not care to release their liberty and undergo whatever indignities might be cast upon them in a military organization. Twice recently intelligent sergeants of the signal corps have said to me that "for the salaries paid to our observers we could obtain some of the most intelligent men in our city; whereas we now have to put up with much less effective work." One of these told me of an assistant in his office who, on a very clear night, recorded the Milky Way as thin clouds moving slowly from the west. Of course, such men in the signal office as fear that they would lose their position by the transfer of the bureau to civilian control are bitterly opposed to the change, and several have given me this very reason for opposing the transfer.

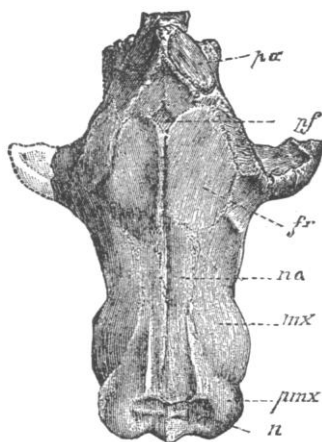
That this communication may, in the present crisis, do something toward influencing the change to civilian control, which I believe so much needed, is my earnest hope.

H. HELM CLAYTON.

Blue Hill meteor. observ.,
Jan. 30.

The pineal eye in *Tritylodon*.

The accompanying cut represents the top of the skull of the remarkable mammal *Tritylodon* Owen. It is reduced to two-thirds natural size, the genus being much larger than any other hitherto known from the mesozoic period. In the interval between the parietals and frontals, *pa* and *fr*, is seen the parietal foramen, *pf*, which has exactly the same position and relations as in the lizard genus *Sphenodon*. In my communication to *Science*, Jan.



28, I spoke of this foramen which lodged the pineal eye "as greatly exceeding that of any of the recent lizards in relative diameter." I find, upon examining the *Sphenodon* skull, that this is a slight exaggeration, and for the words 'relative diameter' should be substituted 'actual diameter.' Even with this limitation, the fact is of remarkable interest, and adds to the rapidly accumulating evidence for the reptilian ancestry of the mammals.

HENRY F. OSBORN.

Princeton, Feb. 1.

Simple qualitative test for artificial butter.

Professor Scheffer (*Pharm. Rundsch.*, 1886, iv. 248) has proposed the following test for distinguishing between genuine and artificial butter: a mixture is made containing 40 volumes of rectified amyl-alcohol and 60 volumes ether of .725 specific gravity at 15°. One gram of butter-fat is dissolved in 3cc. of this mixture at 26–28°. On the other hand, 1 gram lard requires 16cc. of the solvent, 1 gram tallow 50cc., and 1 gram stearin 550cc. For the experiment take a test-tube of 12cc. capacity, and place in it 1 gram fat, add 3cc. of the fusel oil-ether mixture. After tightly corking the tube, put it in a water bath of 18°, and with frequent shaking bring the temperature to 28°. If the butter is pure, the solution becomes perfectly clear at this temperature. If not clear, more of the solution can be run in out of a burette, and the additional quantity required will be some indication of the quantity or quality of the adulterant which has been used.

According to Scheffer, mixtures of pure butter and lard gave the following data:—

Butter.	Lard.	Quantity of mixture required.
1 gram	—	3.0cc.
.9 "	.1 gram	3.9 "
.8 "	.2 "	4.8 "
.7 "	.3 "	5.7 "
.6 "	.4 "	6.5 "
.1 "	.9 "	14.4 "

A trial of this method has shown that it is capable of giving valuable qualitative indications as to the purity of the sample under examination. I believe it is the best simple test, capable of general application, which has been proposed. I have adopted a simpler method of getting sensibly constant weights than the one recommended above. The butters or substitutes to be examined are melted and filtered in the usual way to remove salt, water, etc. A 1cc. pipette is used to measure out the fat, which will be sensibly .9 of a gram. All the graduated apparatus necessary for this test is, therefore, a 1cc. and 3cc. pipette.

The theory of the test is, that tri-stearin is less soluble in the amyl-ether mixture than the other butter-fats, and that the fats used as butter-substitutes contain more of this substance than pure butter. The test is chiefly valuable for its simplicity and wide application.

H. W. WILEY.

Washington, Jan. 28.

German constructions.

I should like to ask your correspondent, Mr. Eggert, if he supposes there exists any other language admitting of so horrible a construction as the placing-together of *six* pronouns in immediate contact?

"O du der du mich dem ich so zärtlich liebe!"

It is true that German writers of to-day show a material gain in clearness over most of those who wrote a hundred years ago, and this is doubtless owing to the increased familiarity of educated Germans with the shorter sentences and less parenthetical forms of construction used in English and French.

M. CAREY LEA.

Philadelphia, Jan. 27.

SCIENCE.—SUPPLEMENT.

FRIDAY, FEBRUARY 4, 1887.

SOME MISCALLED CASES OF THOUGHT-TRANSFERRENCE.

SUCH is the title of an article in *The national review* (January, 1887), by Ada Heather-Bigg and Marian L. Hatchard. This article deserves to be read by every one interested in the subject, and especially by the members of the English society for psychic research. This society takes the position, that, having ruled out fraud and collusion, and still finding a larger ratio of successes than chance would allow, the only thing left is telepathy; and this is forthwith raised to the dignity of a new and omnipotent power explaining all the mysterious occurrences in hypnotism, in 'phantasms of the living,' in deathbed and other presentiments, and the like. The true logical conclusion is, that, such a thing as telepathy being so utterly opposed to the accumulated scientific knowledge of centuries, the probability of finding other sufficient modes of explaining the phenomena in question is extremely great: in other words, the inference is, not that telepathy is a fact, but that the modes of explanation thus far considered do not form a set of exhaustive alternatives.

This is the rational position taken by the writers of this article; and one might say of this, as they do of a similar point, that "it is a striking proof of the blinding effect of preconceived opinion on even careful investigators, that such cautious and candid inquirers as Messrs. Barrett, Gurney, and Myers should have failed to perceive this."

The notion of thought-transference was doubtless suggested by the commonplace and yet very impressive incident of two persons simultaneously expressing the same thought.¹ But knowing, as we do, how closely alike are our modern education and interests, the wonder is, rather, that these coincidences are not more frequent and startling. This process is termed 'similar brain-functioning' in the above article; and the reason why its importance is apt to be overlooked is because "so much of our mental activity goes on sub-consciously. Thus the resembling *results* are forced upon our notice, while the resembling *processes* get overlooked."

¹ Children are very much impressed by such coincidences, and the writer remembers distinctly how in such cases the two children concerned would observe the strictest silence, and, locking their little fingers together, would make a wish which was believed sure to come true.

G. H. Lewes tells a story in point. Walking in the country with a friend, he heard the sound of horses' hoofs behind them, and, when the riders passed by, at once remarked that he was convinced that the riders were two women and a man, which they really were. His companion declared he had formed the same conjecture (evidently thought-transference, says the Psychic research society). Mr. Lewes puzzled over the matter, but could not think of a characteristic distinguishing the sound of a horsewoman from that of a horseman. As, however, it is a fact that men trot and women canter, the two different sounds had unconsciously registered themselves in the brains of himself and his friend.

This shows that (as must occur daily) "two persons may tend to function similarly in response to certain stimuli, yet neither of them be aware of the tendency;" and it is just such phenomena that get utilized by the telepathists.

Guessing a number is a very popular mode of studying thought-transference; and, when the correct guesses are more frequent than the action of chance would predict, the hypothesis of telepathy is thought to be favored. "From this conclusion we emphatically dissent, on the ground that an appreciable percentage of the successes must be put down to the credit of similar but independent brain-functioning. For it is a fact, admitting of easy verification, that the ordinary human mind (provided, always, that it be subjected to no other biasing influence beyond that involved in the verbal framing of the necessary questions) tends to select particular numbers in preference to others:" in other words, these writers have independently discovered the 'number-habit' which Dr. C. S. Minot has so ably discussed in the Proceedings of the American society for psychic research. This discovery was brought about by noticing that quite constantly an undue number of successes occurred at the *beginning* of many sets of number-guessings. The explanation is, that at first the sceptic regards the whole process as nonsensical, thinks of the first number that pops into his head, that is, he follows his number-habit; but later, wondering at the successes, he suspects something, and adopts a more arbitrary mode of selection; whereupon the successes are less frequent.

They verified this supposition by simple experiments; and, to avoid the telepathist's objection that perhaps the tendency to choose particular

numbers was 'transferred,' twenty or thirty friends were asked to put prescribed questions and tabulate the results. The results obtained were entirely confirmatory of the so-called number-habit, and "it is clear that this varying predilection for different numbers materially vitiates all reasoning based on the assumption that we shall indifferently choose *any* number." Not only are particular numbers favored, but there are decided tendencies to select numbers on certain principles: here, again, the results first reached by Dr. Minot are corroborated. For example: in 1,120 trials in which multiples of ten would have been selected 109 times by the action of chance, they were actually selected 307 times. When persons were asked to choose a number (no limits being set), it was found, that, in 172 trials, 84 chose numbers under 20; and 59 of these, numbers under 10. Yet, if you set 1,000 as the limit unconsciously implied by each person, numbers under 20 would occur only 3.26, and under 10 only 1.54 times. Again: when limits were set to the numbers to be thought of, there was a strong disposition to avoid early numbers, and select those near the farthest limits. The table recording the result of the numbers persons are most likely to choose is very suggestive, and should be compared with the tables given in Dr. Minot's report.

In short, as was recognized long ago by some psychologists and writers on probabilities, the human mind is not calculated to act like a die-box or a raffling-wheel, and to have numbers *chosen* is a different thing from having them *drawn*. In fact, it is possible to suggest a certain kind of number-preference by the framing of the question. When the question read, 'Choose a number containing *three* figures,' the digit 3 occurred more than twice as often as it should have done by the action of chance. Of course, this phenomenon is not confined to numbers: guessing letters of the alphabet, names of people and towns, and the like, would be very apt to be unusually successful by reason of independent similar brain-functioning. In choosing letters, three tendencies are observed: 1°, to choose A, B, and C (of 172 people, 37 chose A, 31 B, and 14 C); 2°, to choose one's own initial (this was done 27 times in 172 cases); 3°, to choose Z (12 times in 172 cases).

The arguments in favor of supersensory thought-transference would apply as well to the common simultaneous discovery of new points in science by widely separated observers, or even to the similarity in customs of unrelated savage tribes (which Mr. Tylor so interestingly describes and so rationally explains), as to the number-coincidences of the usual 'telepathic' experiments. The same causes that led to the development of the decimal

system, or to the selection of certain numbers as sacred or ill-omened, are still active in creating the preference for certain numbers which is so easily overlooked. Experiments taking this factor into account can be devised, and, when the results still leave a residue of unexplained phenomena, it is time enough to begin to consider the remote possibility of real telepathy. J. J.

IS BOTANY A SUITABLE STUDY FOR YOUNG MEN?¹

AN idea seems to exist in the minds of some young men that botany is not a manly study; that it is merely one of the ornamental branches, suitable enough for young ladies and effeminate youths, but not adapted for able-bodied and vigorous-brained young men who wish to make the best use of their powers. I wish to show that this idea is wholly unfounded, but that, on the contrary, botany ought to be ranked as one of the most useful and most manly of studies, and an important, if not an indispensable, part of a well-rounded education. In support of this view, these four good and cogent reasons can be adduced:—

1. *The study of botany is an admirable mental discipline.* Any education is defective which includes no training in the scientific method of study; that is, in developing the powers of careful, minute observation and comparison in some department of nature. By this means is acquired the habit of investigation, or the seeking-out of nature's mysteries by the use of one's own senses, instead of trusting wholly to the observations of others. This method of study may be learned through any branch of science; but botany presents this advantage, that it can be pursued with less inconvenience and less expense than any other. The mental training which botany affords is very thorough. The details of plant-structure are infinite, and essential peculiarities are often so hidden as to be recognized only by the most minute investigation. This involves the use of the microscope, which every educated man ought to understand, since it reveals to the eye a newly discovered and wonderful world,—a world of which our grandfathers had but the faintest glimpses, but which is scarcely inferior in interest to that larger world which the unaided eye can see. After this training of the powers of perception and comparison, comes the process of generalization, whereby the laws of vegetable life are determined from the study of plant forms and modes of growth. Thus is acquired the habit of

¹ From the first number of *The Swiss Cross*.

inductive reasoning, or the supporting of every general proposition upon a solid foundation of positive, indisputable fact.

Learning the names of plants is but the beginning of the study of botany. It is like learning the names of our companions or schoolmates before we become really acquainted with them. After we have learned to tell plants apart and to call them by name, we have presented for study such problems as the laws governing their distribution, the relation between the floras of different continents, and the relation of variety to species, which introduces the subject of Darwinism. The study of botany also includes the fossil plants, and, by enabling us to trace the vegetable kingdom from its first appearance upon the earth through all the varying conditions of the geologic ages, opens those tremendous scientific questions as to the birth and infancy of this world of ours which we now see in its maturity, and as to what it will become in its old age. These researches afford not only the amplest mental training, but abundant occupation for the longest life.

2. *The study of botany promotes physical development.* The botanical student must be a walker; and his frequent tramps harden his muscles, and strengthen his frame. He must strike off across the fields, penetrate the woods to their secret depths, scramble through swamps, and climb the hills. The fact that he walks with an earnest purpose gives a zest to these rambles; and he comes home proud and happy from his successful search for botanical treasures, with a keen appetite and an invigorated body and mind. He has enjoyed himself more thoroughly, and gained more substantial benefit, than those who have devoted the same time to the bat, the racket, or the bicycle. In his vacations the young botanist can toughen himself by making long and delightful excursions, living all summer in the open air, and may even have opportunities for joining government exploring parties, and enjoying the active out-of-door life full of adventure and useful experience.

3. *The study of botany is of great practical utility.* It is an essential preparation for several important pursuits. The physician and pharmacist need to have a practical knowledge of those plants which are used as medicines; and, if this knowledge is not acquired in early life, the opportunity never afterward presents itself. For the protection of our rapidly dwindling forests, the services of many skilled foresters will soon be required; and the forester must be a practical botanist. So must also the horticulturist, whether professional or amateur. For the most accomplished botanists, who desire to make this their

life-work, there will always be places as instructive in our many colleges.

4. *The study of botany is a source of lifelong happiness.* Whatever may be one's station or pursuit in life, it is a great thing to have an intellectual hobby, which will afford agreeable and elevating occupation in all leisure hours. Botany is one of the best of hobbies. It can be studied out of doors from early spring till the snow falls; and even in winter there is plenty to be done in the analysis of dried specimens and the care of the herbarium. The botanist lives in the fresh air and sunshine; and when he leaves the world behind, and seeks, amid the solitudes of Nature, to penetrate her wondrous mysteries, he feels the quickenings of a higher life. A taste for botany wonderfully enhances the pleasures of travel, and also gives happiness and content to him who stays at home. It is equally efficacious in preventing the *ennui* of wealth and the anxieties of poverty. If one's surroundings are uncongenial, and life proves full of cares and disappointments, it is a great solace to be able to say with Aurora Leigh,

"I was not therefore sad,
My soul was singing at a work apart."

For these reasons it is obvious that the study of botany is peculiarly rich in those elements which conduce to a vigorous mind and body and a robust character. It is therefore pre-eminently a manly study, and an invaluable part of a young man's education. The student may rest assured that the time and effort devoted to it are well spent; for the result will be to make him a wiser, stronger, more useful, and happier man.

J. F. A. ADAMS, M.D.

THE TENDENCY OF CONTEMPORARY GERMAN THOUGHT.

ROBERT ZIMMERMANN, writing of contemporary German literature in the *Athenaeum*, expresses the following opinion as to the philosophic tendency in Germany:—

"Scientific men, particularly physiologists and anthropologists, whose problems involuntarily touch on the domain of philosophy, and in particular of psychology, are yielding to a spiritualistic impulse that attracts them beyond the limits of the material. The science of man, according to the opinion prevalent among naturalists, is a chapter in zoölogy. The 'Entwicklungsgeschichte des menschlichen Geistes,' by Gustav Haeuffe, of which the first part previously published contains 'Anthropology,' traces back the essence of man's nature to an absolute and indissoluble union of the corporeal with the psychic element, the spiritual soul with the material body,—a method that re-

minds us of Hegel, who had incorporated anthropology as the first chapter of his theory of the subjective intellect, that is, according to his use of language, of psychology, an arrangement in which he was followed by his school. Dubois Reymond's thoughtful and well-expressed 'Akademische Reden' reveal the irresistible need of something beyond this material world in their acknowledgment of 'world riddles' and of psychic phenomena as accompaniments of physical processes. The physicist E. Mach's clear-sighted 'Beiträge zur Analyse der Empfindungen' keep within the limits of 'psychophysics,' without throwing any doubt on the existence of the psychical. However, the collected essays of W. Wundt, who was bred a physiologist, prove that even an investigator who starts from purely empirical causes feels the need not only of philosophy, but also of the special branches that have always been included under this head, psychology, logic, ethics; while even metaphysics, though fallen into contempt, is asserting itself again, however much the aim of this new inductive science may differ from the old speculative one that bore the name."

CONSANGUINITY AND MENTAL UNSOUNDNESS.

THE question of the effects of consanguinity is one of those vexed problems on which much evidence has been collected *pro* and *con*. The observations have been made by careful observers; and the most probable explanation of the diversity of the results reached, is that other circumstances have in some cases cancelled the bad effects of too close interbreeding, and in other cases brought them into prominence. A very fair consideration of the problem is given by Dr. G. E. Shuttleworth, in the *Journal of mental science* for October, 1886.

The common misgiving as to the propriety of cousin-marriages is of rather recent origin. In ancient times marriages of near kin were not forbidden; the first prohibition of them is in the fourth century A.D. The Church soon came to cast its odium on marriages even of the seventh degree of relationship, and the fees for removal of such objections by dispensation were an important source of revenue. This has undoubtedly influenced popular opinion on the question.

From the physician's point of view, the evidence from the animal world is important. Here there is almost a consensus, that, while the effect of 'in-and-in breeding' is to intensify *points*, in the long-run it is opposed to vigor of constitution. It is to be remembered that every breeder takes care to exclude any animals with any known morbid

tendency, while, on the contrary, in the genus *Homo*, as Dr. Clauston remarks, there seems to be "a special tendency for members of *neurotic* families to intermarry." The result of this will be that in some portions of the population the offspring of such marriages will show the evil results of it to an unusual extent. And thus we find, that in rural and especially in mountainous districts, where the population is small and fixed, the comparative amount of idiocy is greater than elsewhere. Statistical information is inadequate on the subject: the motion to include it in the census returns of England was rejected "amidst the scornful laughter of the house, on the ground that the idle curiosity of speculative philosophers was not to be gratified." In France the returns have given rise to various estimates (varying from $\frac{1}{10}$ to $2\frac{1}{2}$ or 3 per cent) of the frequency of consanguineous marriages. Mr. G. H. Darwin came to the conclusion that in London $1\frac{1}{2}$ per cent of all marriages were between first-cousins, in urban districts 2 per cent, and in rural districts $2\frac{1}{2}$ per cent.

If, now, we ascertain the ratio of idiots and insane patients that are the offspring of such marriages to the total number of patients in the asylums, we will have some means of estimating the results of consanguinity. From quite an extended series of records, it is concluded that the ratio just referred to in the idiot-asylums is from 3 to 5 per cent: hence "*first-cousin* marriages, at any rate, are to some extent favorable to the production of idiot children." But this conclusion must be tempered by the consideration that in a large number of such cases of idiocy and imbecility other causes for this condition are present; and this consideration leads Dr. A. Mitchell to the opinion that "under favorable conditions of life the apparent ill effects of consanguineous marriages were frequently almost *nil*, while, if the children were ill fed, badly housed and clothed, the evil might become very marked." From such facts and figures we may conclude that first-cousin marriages should, as a rule, be discouraged; but that, if a close scrutiny reveals no heritable weakness, neurotic or otherwise, the bans need not invariably be forbidden.

ALLGEMEINE NATURKUNDE.

IN the production of elaborate works on natural science for the general scientific reader or student, the Germans are *facile princeps*. Besides bearing evidences of thoroughness and general accuracy, such works usually present a homogeneity and

Allgemeine naturkunde. Leipzig, Bibliographisches institut. 8°. (New York, Westermann.)

completeness rarely attained in English ones of a similar class. To vivacity of expression and the more purely literary embellishments or literary condiments, they rarely make pretensions; and yet he who has read in the original the writings of such authors as Haeckel will readily concede that the German style may be not a whit less charming, less simple, and less interesting than the French or English, while at the same time combining, what is often such a fatal defect in many French works on general natural science, a rigid regard for scientific truthfulness. Buffon made many book naturalists, but he has much to answer for in the self-sufficient complacency and inexactness of many of the French naturalists who have succeeded him. It is a rare talent that can excel in attractive literary exposition, and yet command the respect of the critical scientific naturalist.

At least measurably successful as furnishing interesting and instructive reading for the non-scientific intelligent reader, and as an exhaustive storehouse of information for the general student, is the *Allgemeine naturkunde*, a work, of its kind, which, for fulness of treatment, richness and wealth of illustration, and, withal, general readableness, has rarely if ever had its equal. The work will be completed in nine large octavo volumes, of which four are now issued, and will contain over three thousand engravings on wood, — for the greater part original, — one hundred and twenty colored plates, and twenty maps. The series really is composed of four separate works, which might find their places on the bookshelves of the geologist, botanist, anthropologist, and anatomist, dealing with man, individually and in general, plant-life, and geology in its widest sense. It is intended as a continuation of Brehm's 'Tierleben,' a work well known in itself, as well as from the numerous engravings borrowed from it in the recent English and American natural history works of a similar kind.

The published volume of the two papers on 'Erdgeschichte,' by Neumayr, deals with general physical, dynamical, and stratigraphic geology. 'Der Mensch,' by J. Ranke, treats of the embryology, development, anatomy, physiology, psychology, and zoological relations of man, and is followed by three volumes on 'Volkerkunde' by Ratzel. This latter part is especially full and interesting, and is richly illustrated by engravings, maps, and colored plates. Finally, the remaining two volumes, 'Pflanzenleben,' by Maxilaun, are to contain a general exposition of plant-life, structural, physiological, systematical, and economical, with forty colored plates.

The four volumes now published — 'Mensch,'

'Erdgeschichte,' and 'Volkerkunde' (two volumes) — fully bear out the promises of the publishers. The numerous engravings, colored plates, and the typography are excellent; the descriptive matter readable, and for the most part interesting, and scientific. The style varies, of course, with the different authors, that of Professor Ranke being less clear and terse than that of either Professor Ratzel or Professor Neumayr. From the perusal of what has already appeared, the writer has found generally but little discussion of hypotheses, and, wherever critically examined, full and latest results of modern research. Of the general reliability of the work, the authors' reputations will afford sufficient evidence.

METHODS OF ARROW-RELEASE.

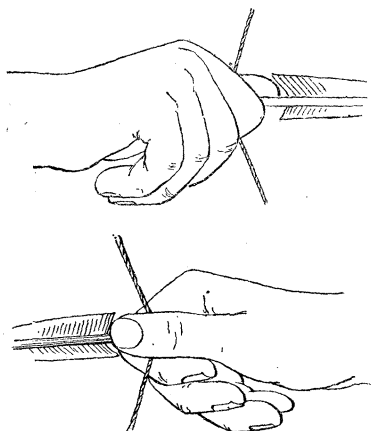
THIS substantial pamphlet, reprinted from the Bulletin of the Essex institute, October-December, 1885, is a noteworthy example of the thorough methods of modern archeological research. Professor Morse has laid under contribution not only narratives of travellers and explorers among the existing savage races, but all available records, graphic and other, of ancient times, to illustrate the manner of using the bow and arrow. This remarkable invention, as the late Lewis H. Morgan, in his well-known work on 'Ancient society,' has shown, did not make its appearance until mankind was well advanced in the savage state towards barbarism; and it has survived to the present time among primitive peoples as the principal weapon of warfare and the chase. It is reasonable, therefore, to hope with our author that interesting results in tracing the affinities of ancient races may be derived from the minute study of the different ways in which it has been employed.

Professor Morse's attention was first directed to the subject by observing that his method of shooting was quite different from that of a Japanese friend: "In the English practice, the bow must be grasped with the firmness of a smith's vice; in the Japanese, on the contrary, it is held as lightly as possible; in both cases, however, it is held vertically, but in the English method the arrow rests on the left of the bow, while in the Japanese it is placed on the right. In the English practice a guard of leather must be worn on the inner and lower portion of the arm to receive the impact of the string; in the Japanese no arm-guard is required. . . . In the English method the string is drawn with the tips of the first three fingers, the arrow being lightly held between the

Ancient and modern methods of arrow-release. By EDWARD S. MORSE. Salem, Bull. Essex inst. 8°.

first and second, the release being effected by simply straightening the fingers; in the Japanese the string is drawn back by the bent thumb, the forefinger aiding in holding the thumb down on the string."

Thus set upon inquiry, he has discovered that there are, or have been, five different methods in vogue in the use of the bow and arrow. The simplest consists in "grasping the arrow between the end of the straightened thumb and the first and second joints of the bent forefinger. . . . With a light bow, such a release is the simplest and best; and it makes but little difference upon which side of the bow the arrow rests, provided the bow is held vertically. This release, however, prevents the drawing of a stiff bow, unless one possesses enormous strength in the fingers." He calls this the 'primary release.'

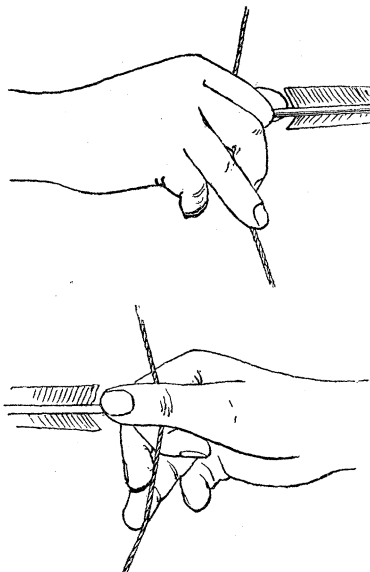


FIGS. 1 AND 2. — PRIMARY RELEASE.

It appears to have been the method used by the natives of this country, when first discovered, according to William Wood's quaint description: "For their shooting they be most desperate marksmen for a point blanche object . . . they can smite the swift-running Hinde and the nimble-winged Pigeon without a standing pause or left-eyed blinking; they draw their Arrows between the fore finger and the thumbe; their bowes be quick, but not very strong, not killing above six or seven score" (*New England's prospect*, part ii. chap. xiv., Prince soc. ed., p. 97). Several of the American tribes still practise this method of release, and our readers have doubtless seen Indian boys shooting in this manner. This is also the habit followed by the Ainos, the primitive inhabitants of Japan.

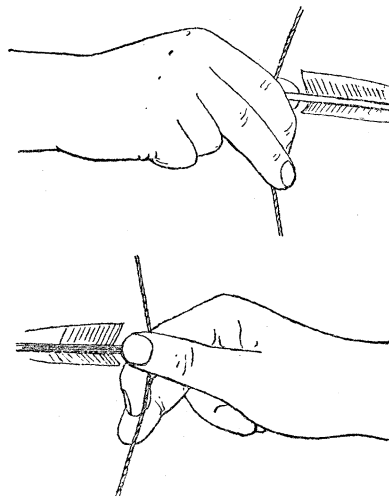
The second manner of release "consists in grasping the arrow with the straightened thumb and

bent forefinger, while the ends of the second and third fingers are brought to bear on the string to assist in drawing." This is an advance upon the first through the help afforded by the other fin-



FIGS. 3 AND 4. — SECONDARY RELEASE.

gers in drawing the string. This is designated as the 'secondary release,' and is stated to be the method employed by the Zuñis, the semi-civilized Pueblo tribe, living in the north-western part of New Mexico.

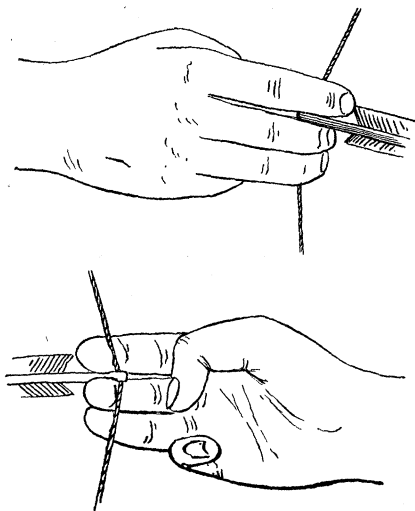


FIGS. 5 AND 6. — TERTIARY RELEASE.

The third method, which he styles the 'tertiary release,' "differs in the position of the forefinger,

which, instead of being bent and pressed against the arrow, is nearly straight, its tip, as well as the tip of the second and sometimes that of the third finger, engaging the string." This is the kind of release practised by most of the western tribes of this country.

"In holding the bow horizontally, the release-hand is held with the palm uppermost, the arrow, of course, resting on the bow, . . . but necessities arising, as in shooting in a forest, or shooting side by side with others closely appressed, the bow was required to be held vertically. In thus turning the bow-hand in the only



FIGS. 7 AND 8. — MEDITERRANEAN RELEASE.

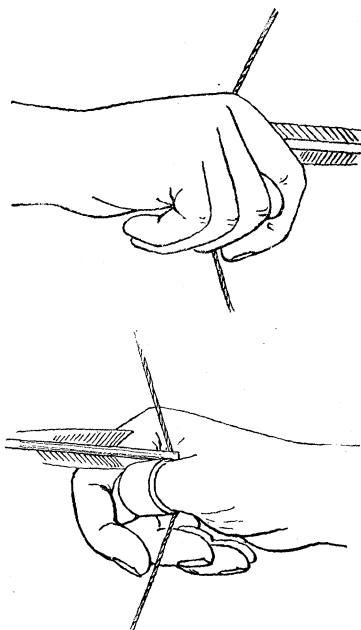
way it could be turned conveniently, the arrow would be brought to the left of the bow vertical. . . . In the primary and secondary releases, however, it makes but little difference on which side the arrow is placed; and some tribes, using the bow vertical, place the arrow to the right, and this is probably a quicker way of adjusting the arrow when shooting rapidly."

Professor Morse next considers a form of release "which by documentary evidence has been in vogue among the Mediterranean nations for centuries. It is the oldest release of which we have any knowledge. It is practised to-day by all modern English, French, and American archers, and is the one practised by European archers of the middle ages. It consists in drawing the string back with the tips of the first, second, and third fingers, the balls of the fingers clinging to the string, with the terminal joints of the fingers slightly flexed. The arrow is lightly held between the first and second fingers, the thumb straight and inactive."

Since it has been practised by the Mediterranean nations from early historic times, he very appropriately calls it the 'Mediterranean release.'

"This is unquestionably an advance on the others thus far described, as it enables the drawing of a stiffer bow, and is exceedingly delicate and smooth at the instant of loosing the arrow." It is quite remarkable that this method of release is practised by the Eskimo; which circumstance tends to confirm Prof. Boyd Dawkins's theory that this people is the direct representative of the cave-dwellers of southern France. The Eskimo are the only people known to Professor Morse, who have designed a distinct form of arrow for this method of release.

Finally Professor Morse proceeds to examine an entirely independent release, having no relation to the others. "In this the string is drawn by the flexed thumb bent over the string, the end of the forefinger assisting in holding the thumb in this position. The arrow is held at the junction of the thumb and forefinger, the base of the finger pressing the arrow against the bow. For this reason the arrow is always placed to the right of the bow vertical. This release is characteristic of the Asiatic races, such as the Manchu, Chinese, Kore-



FIGS. 9 AND 10. — MONGOLIAN RELEASE.

an, Japanese, Turk, and doubtless other cognate peoples."

As it is practised almost exclusively by Mongolian nations, he calls it the 'Mongolian release.'

In this release the thumb has to be protected by

some kind of a guard, which is generally a thick ring. "The releases vary in their efficiency and strength. The two strongest and perhaps equally powerful ones are the Mediterranean and Mongolian; and it is interesting to note the fact that the two great divisions of the human family who can claim a history, and who have been dominant in the affairs of mankind, are the Mediterranean nations and the Mongolians. For three or four thousand years, at least, each stock has had its peculiar arrow-release, and this has persisted through all the mutations of time to the present day. Language, manners, customs, religions, have in the course of centuries widely separated these two great divisions into nations. Side by side they have lived; devastating wars and wars of conquest have marked their contact; and yet the apparently trivial and simple act of releasing the arrow from the bow has remained unchanged. At the present moment the European and Asiatic archer, shooting now only for sport, practise each the release which characterized their remote ancestors."

We wish it were in our power to follow our author through his detailed investigations of the peculiarities in the use of the bow he has discovered in his truly marvellous study of the ancient monuments; but that is impossible. In a classified list he has given, under the heads of 'recent' and 'ancient,' all the tribes and nations who have practised the five different kinds of release described, and he concludes by begging for further information:—

"Travellers and explorers ought also not only to observe the simple fact that such and such people use bows and arrows, but they should accurately record, 1°, the attitude of the shaft-hand; 2°, whether the bow is held vertically or horizontally; 3°, whether the arrow is to the right or to the left of the bow vertical; and, 4°, whether extra arrows are held in the bow-hand or shaft-hand. The method of bracing the bow is of importance also. . . . Particularly does he desire to learn the release as practised by the Veddahs of Ceylon, the Hill tribes of India, the tribes of Africa, South America, and especially the Fuegians. Indeed, any information regarding the methods of arrow-release in any part of the world will be acceptable."

In answer to his inquiry, we venture the suggestion whether it is not possible that the so-called 'pierced tablets,' which are described and figured by Professor Rau (*Archeological collection of the Smithsonian institution*, p. 33) and other writers, and which have given rise to so much discussion among American antiquaries, may not have been guards worn to protect the wrist against the recoil of the bow-string.

H. W. H.

THE BUTTERFLIES OF NORTH AMERICA.

ONE welcomes an old friend more cordially than a new; so that when Mr. Edwards, after some hesitation, starts a third series of his renowned and incomparable illustrations of our native butterflies, begun twenty years ago, we are ready to render the full meed of praise for his unwearied energy, the success of his breeding experiments, and the more than liberal, almost profuse illustration with which they are published. When we know, in addition, that he has parted with a considerable portion of his unique collection to obtain means wherewith to launch this new series, we can only hope he will find a public properly appreciative of such zeal and sacrifice.

This first number is a reminiscence of the past. Two of the three plates represent hitherto unfigured species of that wonderfully prolific boreal genus *Argynnis*, one from Assiniboia, and the other from Utah and Arizona, with brief merely descriptive text—which remind us especially of his first series, where nearly seventy figures of this genus were given. The remaining plate gives not only the butterfly with its variations, but also all the earlier stages of our Californian species of *Megonostoma* (or, as Mr. Edwards prefers to class it, *Colias*), with many enlarged figures of minor details, accompanied by a tolerably full account of the insect—which recalls the more definitely biological character of the second series. To obtain the earlier stages, eggs were sent from California to West Virginia, and the caterpillars raised on an *Amorpha*, previously sent, in Mr. Edwards's garden.

The text is not so full or interesting as the later parts of the last series; but to say that the same care as before has been taken with the illustrations, whether in faithfulness of delineation to the last detail, or in truthfulness of coloring with an absence of all gaudiness, is quite enough. Nothing has ever surpassed them; they are a perfect model for such work. The same artists have been connected with the work almost from the first; and though the chief artist, Mrs. Peart, can no longer undertake the lithography with her own hand, they receive her careful supervision.

We can only congratulate naturalists on Mr. Edwards's determination to continue publishing on the same scale as before, and beg to remind them, that, but for this liberality, we should hardly have advanced in knowledge of the life-histories of our butterflies beyond what we knew when Boisduval and LeConte published their little octavo—a half-century ago.

The butterflies of North America. By W. H. EDWARDS. Third series. Part I. Boston, Houghton, Mifflin & Co. 4°.